The Colonial & Post-Revolutionary Era Dye Garden

New England

Supplement to a presentation on the colonial dye garden given by

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Textiles in the Colonial and Post-Revolutionary Era

Early settlers to what became the New England colonies expected the climate to be as mild as southern France. It came shock to encounter winters that were much colder than those in England. The newest settlers in America only brought as many supplies and household goods that they could for the conditions they expected. They ultimately needed to supplement their goods with imports and by learning their new land.

Textiles, which are labor-intensive to produce, were treasured for survival. They were used for clothes, home goods/furnishings, insulation, building materials, and farming and livestock tools. Until the Revolution, the colonies mostly imported textiles from Britain that were sourced from India, China, and England. It was less costly and labor-intensive to import textiles than produce them in the colonies.

Although there were domestic producers, largely in the northeast, they were the exception rather than the rule. However, laws began to be passed to incentivize household cultivation of textile plants—namely hemp and flax—and home-based commercial weaving. Wool was sourced from different sheep breeds, with merino being the most desired because of its soft texture and ease of spinning. Cotton was also sometimes used and blended with flax or wool but was not widely used until the invention of the cotton gin.

The revolutionary war cry "Taxation without representation" was what really led the way to home-based and industrial textile production, including textile dying. Growing textiles and dye plants as well as spinning, weaving, felting, and dying became Revolutionary acts associated with a new spirit of independence.

Achillea millefolium **Yarrow**

Other names: Devil's Nettle, Milfoil, Soldier's Woundwort

Yarrow is a member of the daisy (Asteraceae) family and is native to Europe, Asia, and North America. The delicate, fernlike leaves of this plant are an important feature that can help distinguish it from Queen Anne's lace and poison hemlock. Like these other plants, yarrow forms discs of small, white flower clusters.

Yarrow is commonly found in fields and roadsides and is easy to grow. Seeds can be sown in early spring or fall. The plants also can be divided at the roots and replanted in the spring and fall. Attractive to butterflies and bees, it can be a great addition to a pollinator garden. Nurseries now also sell colorful ornamental cultivars of yarrow.

Yarrow produces pale yellow to green dye and can be used fresh or dried. To make a dye from yarrow, collect the flowering plant tops and pour boiling water over them just enough to saturate the plant matter. Let it soak overnight or longer. When ready to dye, add more water with care not to dilute the dye too much and simmer the dye stuff for about an hour, strain, add well-soaked mordanted fiber/fabric. Simmer for an additional hour.

To intensify the color, immediately place the fiber in a container filled with a solution of water and ammonia (the pH should be up to 10 to 12). In earlier times, stale urine was used for this pH-shifting process. Nowadays, ammonia or (safer) a small amount of washing soda mixed with water is generally used by home dyers. After a minute, remove the fiber. The color will have deepened.

False Indigos: Baptisia australis and *Baptisia tinctoria*

Baptisia australis

Baptisia australis, or blue false indigo, is a member of the pea (Fabaceae) family and is native to central and eastern North America. It is a bushy, robust perennial that displays blue-purple, pea-like flowers on dense, upright branches that grow up to 16 inches long. Blueish-green leaves that appear as trios of leaflets resembling clover grow along the branches. The plant also produces pea- or bean-like seed pods that turn black as they age.

Native Americans and early settlers used the leaves of this species to make yellow, green, and brown dyes. A yellow or yellow-green dye can be gotten from simmering the leaves. A deep forest green can be gotten by placing leaves in a mason jar or similar container and filling the jar with water and ammonia in equal parts and letting it sit to ferment for about 3 days. A deep brackish dye will be produced that can be diluted and simmered (outdoors) with well-soaked, mordanted protein fiber/fabric (wool or silk) to yield a deep forest or olive green.

Baptisia tinctoria

Colonialists were more interested in *Baptisia tinctoria,* or yellow false indigo, *than Baptisia australis*. Their hope was that this *Baptisia* species would be a decent substitute for true indigo. *Baptisia tinctoria* is similar to blue false indigo but produces yellow flowers and is native to southeastern states. The leaves have small amounts of indigotin—the chemical in true indigo that produces the rich blue dye. Native Americans used this plant to make blue dye from the leaves and yellow from the flowers. Although colonialists had high hopes that this species would be a good, homegrown, inexpensive substitute for true indigo on the industrial level, the plant fell short of expectations.

A note about true indigo *(Indigofera tinctora)*

True indigo is a perennial shrub native to Japan, China, and India. It produces various shades of a rich blue. Indigo, rich in indigotin, has been used as a dye plant for over 3000 years. It thrives in the warmer USDA Hardiness Zones 10 to 12 (Florida and the tropics) and became industrially cultivated in some southern states in the 19th century. Connecticut USDA Hardiness zones range from 5 to 7 and so cannot accommodate this plant.

Galium verum   Lady’s Bedstraw

Other names: Yellow Bedstraw

Lady’s bedstraw is an important Old World dye plant in the madder (Rubiaceae} family. The flowers are used to make yellow dye. The roots, when skillfully processed, can produce reddish or pink dye.

Lady’s bedstraw thrives as a weed in sunny fields and roadsides in the United States. Indeed, it has invasive status in some parts of the US.

The plant was once used to stuff mattresses and pillows and got its name from a fable that it was the bedding on which the Virgin Mary lay when giving birth to Jesus. It is characterized by whorled, thin needle-like leaves and clusters of small, fragrant yellow flowers that bloom from June to September.

If you have an interest in cultivating Lady’s bedstraw, consider growing it in a container. As noted, Lady’s bedstraw is a weed that can quickly overtake a field or garden. It likes sun but will tolerate part shade.

To create a yellow dye, Lady's bedstraw flowers are gently simmered in water for up to 45 minutes. This is the process to produce a clear, soft yellow for any flower in that color range (eg, daffodils, goldenrod, calendula, marigolds, etc.) To create a red, pink, or tawny dye, the roots are cut up and boiled.

Similar tawny-colored dye effects can be gotten from the roots of some other species of bedstraw, including cleavers *(Galium aparine),* northern bedstraw *(Galium boreale),* and stiff marsh bedstraw *(Galium tinctorium).*

Cleavers (Gallium aparine)

Genista tinctoria **Dyer's Broom**

Other names: Dyer's Greenwood, Dyer's Greenweed

Dyer's broom is a perennial in the pea (*Fabaceae*) family. Native to Europe and Asia, dyer's broom is now found across the United States, including the Northeast, and is invasive in some areas.

It is characterized by its upright, striped branches covered by elliptical leaves. The plant bears pea-like yellow flowers that grow in clusters on stems along the upper portion of a long, leafy branch. The full flowery display often does not develop until its second year of growth. Narrow, oblong seed pods develop after the flowers fade.

It is easy to grow dyer's broom. You can purchase seeds, which should be soaked in warm water overnight and then planted in the fall or spring in well-drained soil in full sun. Expect first-year plants to be small and leafy and fuller in the second year of growth.

Use of dyer's broom can be traced back to the Viking era. In addition to use as a dye plant, young shoots and branches were used to craft brooms.

The plant's flowers are used to yield a yellow dye and the leaves and stems produce a green dye.

The dying procedure is simple. Gently simmer the flowers or other plant parts in water for about an hour, strain, and then add wet, mordanted fiber/fabric and simmer for another hour. For clear yellows, soaking the flowers in water overnight before simmering them is recommended.

Isatis tinctoria **Woad**

Dyer’s wood is in the mustard (Brassica) family of plants. It is native to southeastern Russia and brought to the Eastern US by colonialists. Although not a problem plant in the Eastern States, it is now considered an invasive weed in the Western US. It is a biennial, starting out as a basal rosette in its first year of growth and growing long stems and brackets of yellow flowers and lots of blue/purple seed pods in its second year.

It has been used since ancient times to make a brilliant blue pigment and was a major source for it until industrial dyers began to prefer indigo. As with indigo, extracting the dye from woad leaves is a bit of an ordeal, often involving a lengthy, intricate, and smelly fermentation processes.

Dyer’s wood is a field weed and is easy to grow from seed. It prefers dry, coarse-textured, rocky soil. It grows aggressively from seed spread so care must be taken if you choose to cultivate it in a dye garden.

The blue dye is extracted from leaves of the first-year growth—the ground-hugging rosette. The leaves need to be used fresh. Traditionally, fermentation in an alkaline solution is required. In colonial times, this was stale urine (basically, ammonia). Modern recipes call for use of soda ash and a complicated process of aerating the dye vat and, like with indigo, processing the dye vat over the course of days to weeks to achieve a separation of sludge and liquid. The sludge is “washed” though a series of delicate water changes. It can then be poured off to dehydrate into a blue chalky substance for later use or mixed with an alkaline solution that is also left to settle. Books and YouTube are filled with various dye processing techniques. When used in a dye vat, as with indigo, the fiber is placed in the dye for a few minutes, taken out, and exposed to air at which point, oxidation causes the blue color to bloom.

A blue dye can be gotten quickly for a small amount of protein fiber (eg, wool) by placing the leaves, a healthy pour of salt, and the fiber in a bowl and kneading this mixt until the leaves are well macerated, release liquid, and stain the fiber. The dye will oxidize and turn from green to blue after few minutes.

A tan or pinkish dye can be gotten by simmering the woad leaves for about 45 minutes, adding wet fiber/fabric (no mordant is needed) to the dye pot without removing the leaves and simmering for another 30 minutes.

The seeds also can be a source of pink to purplish dye. To use the seeds for dye, collect enough (weight should be equal that of the amount of fiber to be dyed) and simmer for about an hour, strain, add wet fiber/fabric and simmer for another 30 minutes.

Reseda luteola **Weld**

Other names: Dyer's Rocket, Dyer's Mignonette

The Weld plant is native to Europe, Asia, and North Africa and was introduced to the New England colonies where it became naturalized. A biennial member of the *Resedaceae* family, weld is now considered a weed and can be found growing by roadsides.

The yellow dye produced by weld is one of the oldest as well as one of the most light-fast (non-fading). The seeds are the primary source of the yellow dye, but the plant tops will also yield colors ranging from yellow to khaki green depending on the mordant used for the fiber. Although the plant was prized as a yellow dye and brought over by colonialists, it soon fell out of use in the States, as other plants—mainly fustic, derived from a native tropical mulberry tree, and quercitron, a dye derived from the inner bark of the native black oak tree—produced stronger yellows with less dye stuff material needed.

Weld is easy to grow from seed by simply spreading seeds in the planting bed or pot in the spring. Like woad, the first-year plant appears as a ground-hugging rosette of lance-shaped leaves. In the second year, the leaves grow in an alternate pattern on long stems that are topped with small white flowers that bloom in late spring to early summer. The blooms produce a profusion of kidney-shaped seeds.

To make a dye using the plant tops, cut up the material, pour boiling water over it and let it steep overnight or even for a few days. When ready to make a dye, gently simmer the plant matter for about an hour, strain, add the mordanted, well-soaked fiber/fabric and either let the fiber steep in the dye or else gently simmer it for another hour. Adding a small bit of soda ash (or ammonia) to raise the pH to 7 may help deepen the color.

Rubia tinctorum **Madder**

Revolutionary soldier uniform. Henry Whitfield State Museum, Guilford, CT

Madder, an ancient and famed source of bright red dye, is a member of the Rubiaceae family of plants. It has evergreen, sticky, lance-shaped leaves. In its second and third year of growth, it will produce small yellow flowers in June and small red-to-black berries in the late summer/fall.

Native to Asia and cultivated in Europe, madder made its way to the Americas in about the 18th century. Colonists were familiar with the British soldiers red uniforms. The uniforms of lower-rankng officers were dyed using madder whereas the uniforms of higher-ranking officers were dyed using the more costly cochineal dye, derived from cochineal insects imported from Central and South America.

Madder was mostly imported rather than widely cultivated although Thomas Jefferson and Dolly Madison greatly promoted its cultivation. Processing the plant for dye involves harvesting the roots. If you cultivate madder for dye in a home garden, you will need to patiently wait at least until the third year of growth when the roots are thick and strong. That said, it is easy to grow in full sun in loamy, sandy, well-drained soil. (Adding some gardening lime to the soil helps boost the color you can get from the roots.) It easily self-roots when long stems touch the ground.

Woman's cloak. Henry Whitfield State Museum, Guilford, CT

According to Thomas Jefferson, the fresh roots should be beaten into a paste 12 hours after harvesting before simmering. Modern dye instructions suggest placing the roots in a fine mesh bag and soaking them for 24 hours to release the dye. The dye (which can be extended and diluted with more water) and the bag with the roots are then simmered with wet, mordanted fiber/fabric at a low heat for about 30 minutes.

More industrialized early processing of madder involved a series of steps including washing, sorting, roasting/drying and creating a paste or powder as well as aging the madder.

For the home dyer, experimentation and a sense of adventure are key. Tan and pinks can be obtained from making a dye from the tops of the plant and its berries, and reddish and pink or purplish dyes can be extracted from the roots of other species of *Rubia* as well as related *Galium* (bedstraw and cleavers) species.

Symphytum officinale Comfrey

Other names: Knitbone, Healing Herb, Bruisewort

Comfrey is a member of the borage (*Boraginaceae)* family and native to Europe and Asia. It can now be found throughout the United States. The plant grows up to 3 feet and has tuberous roots. It has large, pointed, oval or lance-shaped leaves. Like borage, leaves and stems are hairy. Flower colors vary from white to pink to purple. Flowers are bell-shaped and grow in clusters on stems along the branch.

Comfrey can be found growing in damp grasslands and prefers damp soils and shade. If you choose to plant it, be aware that it spreads rapidly and is weedy.

Green dye is extracted from fresh or dried comfrey leaves. To extract the dye, cut up the leaves, place in a dye pot, and pour boiling water over them. Let them soak overnight and then simmer the leaves for 1 to 2 hours. Once cooled, strain the liquid and add your well-soaked fiber to the pot and simmer for another hour or so. Then, let the fiber sit in the dye pot overnight. No mordant for dying wool is needed but use will improve color fastness. Cellulose fibers like cotton and flax require an alum mordant.

Tanacetum vulgare Tansy

Other names: Bitter buttons, Golden buttons

Tansy is a member of the daisy (Asteraceae) family. It is native to Asia and Europe, was brought to the colonies by the settlers and has naturalized in many areas but also has been designated an invasive in many Midwest and Western United States.

The plant is an aromatic flower that can grow up to 5 feet high and spreads via a network of rhizomatous roots. The round, velvety, button-like yellow flowers bloom in clusters at the end of strong stems.

The plant has long been used as a strewing-herb and insect repellent and has had medicinal and mortuary uses. A highly aromatic plant, leaves smell of camphor and are fern-like. An important cautionary note, though, is that handling tansy can cause contact dematitis for some people.

Tansy can be grown by sowing the seeds in the spring. Like other weeds, it is versatile regarding soil and sun conditions. Because it spreads rapidly, it is advised to grow tansy in a container and minimize seed spread.

Flowers produce dyes ranging from strong yellow and gold to yellow-tans. Leaves yield yellow-green and green.

To make dye with the flower tops, simmer them for about 45 minutes, strain, add well-soaked, mordanted fiber/fabric and gently cook for another 30 to 60 minutes. To make a dye with the whole plant, chop it up and simmer for an hour, strain, add the fiber and simmer until it seems the fiber has sufficiently absorbed the dye.

The Art and Science of Natural Dyes

Fibers, Mordants, and pH Shifting

Fibers

Fibers used for thread, yarn, cord, and textiles can be made from protein, cellulose, or synthetic sources. Examples of protein fibers include those harvested from animals or insects. Examples include wool, alpaca, mohair, angora, and silk. Cellulose fibers are those harvested from plants, such as cotton, flax (linen), and hemp. Synthetic and semi-synthetic fibers, common in the modern world of textiles, include rayon/viscose from bamboo, acrylic, and polyester, among others. In addition to rayon/viscose (two names for the same product), semi-synthetic fibers are now made from a wide range of plants and involve chemically processing parts of them into fibrous substances.

Protein fibers

Most protein fibers come from the sheared fleece of mammals, most commonly sheep, which over time have been bred to produce different textures of wool. During colonial times merino sheep were prized and preferred for the soft, elastic, and long texture of their wool. Luxury protein fibers are now sold from different breeds of sheep, alpaca, camel, yak, angora rabbits (angora), angora goats (mohair), and various other, more exotic animals.

Silk is a protein fiber derived from the cocoons of different species of silk moths. Colonialists also made use of silk from imported silk thread and fiber.

In processing silk, the cocoons are harvested, gently cooked to remove a waxy substance, and spun into thread. Nowadays, the silkworm is sometimes spared in this process instead of being cooked in the cocoon. The fiber sold is marketed as “peace silk.”

Cellulose fibers

Flax , hemp, and eventually cotton were the staple fiber crops in the colonies.

Cotton fiber is gotten from the seed coat of the plant, which is part of the pod (boll) that surrounds the seeds. Cotton processing involved separating the seeds from the fiber. It was not until Eli Whitney's invention of the cotton gin, patented in 1794, that cotton became a viable commercial crop. The gin was a relatively efficient mechanism to remove the seeds from the fiber.

Flax was processed into linen by thrashing, scrutching (smashing/mashing), hackling (a rougher combing process), and combing stalks of flax until they are reduced to strong thread. Although you may be hard pressed to find a flax plant growing in the area, at one time, New England meadows were full of it.

For hemp, a process similar to flax was used with additional steps. The stalks were retted (soaked to dissolve and better separate the vegetable dross from the fiber), rolled in a press, scrutched, hackled, and combed.

Other natural cellulose fibers are mainly gotten, like with hemp, from separating strong, threadlike fibers in the outer layer of plant stalks from the woody and vegetable matter. This involves stripping the outer layer from the plant stalk and scrapping and then combing the outer layer to remove vegetable matter from strong, threadlike strands of fiber. Nettle fiber is an example of this. Retting is sometimes involved to better break down the vegetable matter around the strong fibers. In other instances, the stalks are dried or not harvested until the plant has died and become dry at the end of the season. This is the case with dogbane (also called Indian hemp) and milkweed. In addition to these plants, fiber can be extracted from bramble and burdock stalks and bittersweet vines as well as various tropical trees and shrubs.

From Fiber to Yarn/Thread

Fiber meant for processing into yarn needed to be spun. Protein fiber could be spun right from fleece or else put through additional processing that involved hackling and combing to get the fibers to smoothly all run in the same directions, forming smooth strips of fiber called roving.

The fiber could be spun using a spindle, a device similar to a spinning top, or, eventually, a spinning wheel. Most colonial homes had spinning wheels, and it is interesting and maybe sad that a device that was so ubiquitous to household life the world over for centuries is now considered a rare and curious find or an apparatus for a niche hobby.

The spun yarn could be used for knitting or other needle arts but often was woven into fabric, with many homes having looms in addition to spinning wheels. Wool fabric might also be "finished," which involved carefully felting the fabric for use in making waistcoats and other heavier formal wear. Finishing was a process typically done at the commercial and industrial level rather than in the home. That said, wool could also be processed into felt instead of yarn by hackling and combing and then compressing, massaging, and beating it with water and soapy suds until it became a tight fabric. Artisans continue to do this today in a process called wet-felting to make beautiful OOAK clothing and soft sculpture.

Mordants

Mordants are chemicals that bind to fibers to allow them to hold a dye. To mordant fiber, the unspun fiber, or yarn or cloth is simmered or soaked in the mordant. The type of fiber and mordant used affects the color that the fiber will pick up. Metal salts and tannins were typically used as mordants in colonial times.

Metal salts were/are typically used to mordant protein fibers. These salts include alum (aluminum sulfate or aluminum acetate), iron (ferrous sulfate), titanium oxylate (titanyl potassium oxylate), copper (copper sulfate), chrome (sodium dichromate**),** and tin (stannous chloride). Alum, iron , and titanium oxylate are recommended for home dyers, while copper, chrome, and tin require greater safety precautions due to toxicity risks. Chrome and tin are especially discouraged for home use.

Tannins, such as those gotten from boiling oak galls or acorns among other vegetation, and oxalic acid, which can be extracted from wood sorrel, also were used to mordant protein fibers and were essential in mordanting cellulose fibers. Nowadays, however, aluminum acetate plus wood ash is often recommended as a mordant for cellulose fibers, which are generally reluctant to pick up a strong dye color.

Alum usually provides colors that are similar to but richer than the natural unmordanted dye color. Iron "saddens" colors, meaning it adds grey or muted green hues. Titanium oxylate alone or combined with a tannin provides rich orange base color. Copper helps shift colors to greens or blueish greens. Tin brings out vibrant orange/ruddy hues. Chrome can give effects similar to copper and tin. Again, use of copper, chrome, and tin mordants is best left for very experienced crafters and artisans who have laboratory settings and safety gear to do their dye experiments.

pH Shifting

pH is a scale that measures how acidic or alkaline a substance is. The scale ranges from 0 to 14, with 7 being neutral. Values below 7 indicate acidity, while values above 7 indicate alkalinity. A home dyer can measure pH of dye pots by using pH strip kits.

Water is typically in the neutral range, but rainwater in certain areas can be on the acidic side. The pH of water can affect natural dying effects but can be pH adjusted.

Vinegar and citric acid are used to make a dye solution more acidic, whereas substances such as baking soda, washing soda, wood ash, and ammonia will make a dye solution alkaline. An acidic dye can shift color toward a warmer reddish hue while an alkaline dye can shift a color toward a cool hue. The pH shifting can occur at different times during the dye process.

In colonial and earlier times, alkaline solutions were used for different dye processing techniques, including pH shifting, dye-stuff fermentation, and oxidation processes. Fermentation and oxidation were especially important in creating woad and indigo dyes. The product used to create the alkaline solution was stale urine, which is, essentially, ammonia. Nowadays, home dyers can use ammonia in well-ventilated spaces but are encouraged to use a small amount of washing soda or wood ash instead as a safer alternative. (Note that too much washing soda in a mordanting bath will destroy the fiber.)

Dye Ferment

Extracting dye from some plants involves steeping the dye materials in a container filled with equal parts water and ammonia (or urine or in a solution of washing soda). The container is left to sit for days to months. It is shaken and aerated every once in a while. When the color looks deep enough, it is used as a dye. Certain lichens and mushrooms are processed in this way to yield rich purple, lavender, violet, blue, and reddish dyes. There are several books and YouTube videos on how to extract dye from mushrooms and lichen in this way.

Resources for Further Study

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The Conococheague Institute – episode: Dying for Color: Natural Plant Dyes in the 18th Century

Culture & Heritage Museums – episode: 18th and 19th Century Textile Production

Ken Giorlando – episode: 1760 Daggett Farm House – Dying Wool in Colonial Times

Master Gardeners of Northern Virginia – episode: The Dye Garden

Morgan Rimmer – episode: Dye Making in Colonial America

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Sally Pointer – demos on Neolithic textiles with relevance to ongoing textile and dye crafting in history sdamuseum – episode: Dyer’s Garden Series: Plants for Dying

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